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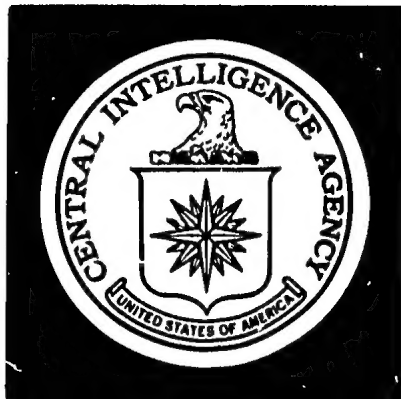
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DIRECTORATE OF  
INTELLIGENCE

# Intelligence Memorandum

*The Current Capabilities of the Trans-Siberian Railroad:  
A Preliminary Review*

DIA review  
completed.

**Secret**

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September 1969

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CENTRAL INTELLIGENCE AGENCY  
Directorate of Intelligence  
September 1969

INTELLIGENCE MEMORANDUM

The Current Capabilities  
of the Trans-Siberian Railroad:  
A Preliminary Review

Introduction

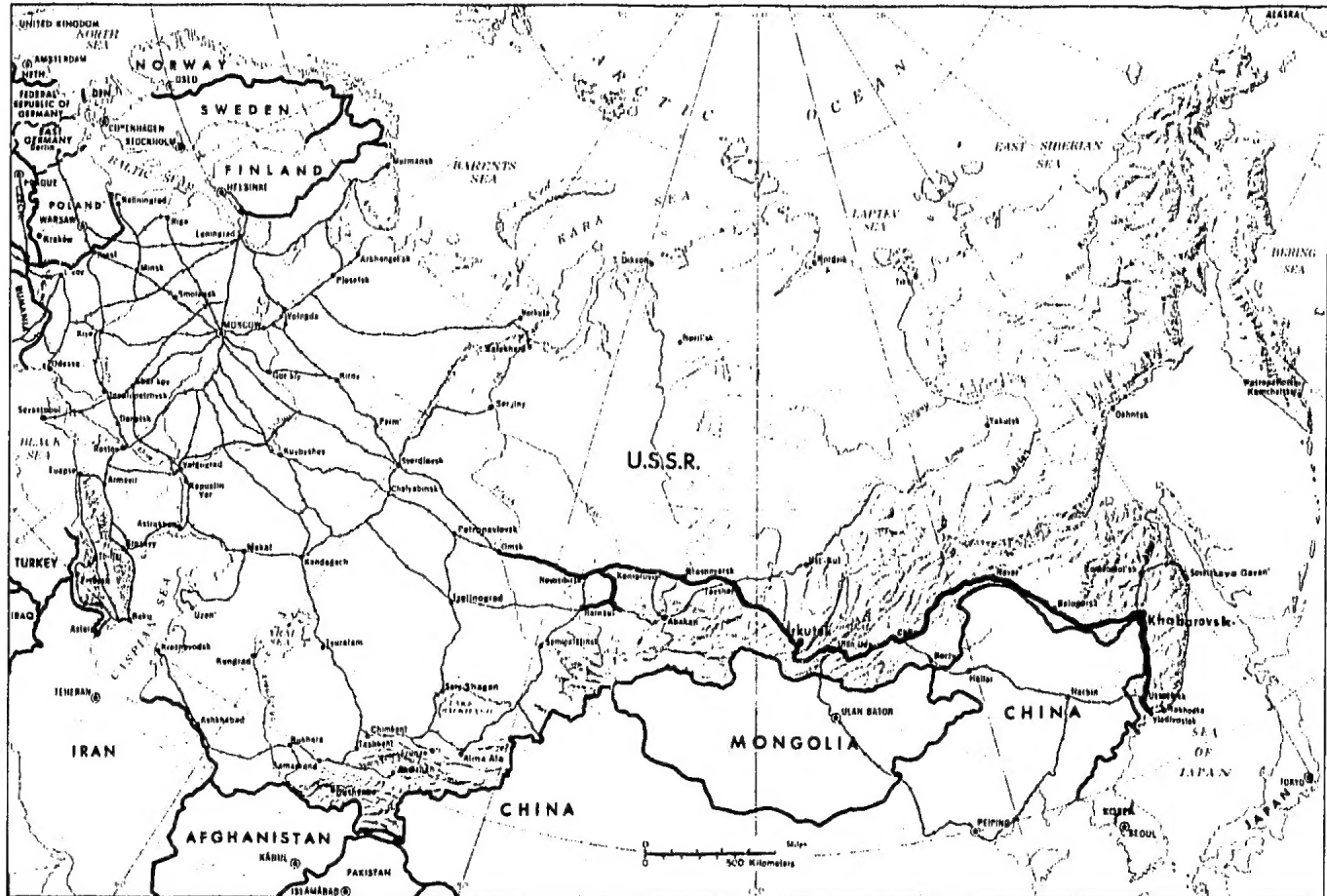
This memorandum represents a preliminary study, and its conclusions should be viewed as tentative. A study in depth is under way, but its findings will not be available for several months. The present publication has been prepared in view of the current need for an estimate of the capabilities of the Trans-Siberian Railroad because of the possibility that Sino-Soviet border clashes may escalate into large-scale warfare. It provides a brief description of the Trans-Siberian Railroad (see the map), its increased traffic handling capacity -- including the impact of dieselization and electrification -- and a review of the plans for further upgrading. The section of this memorandum "Capability for Military Support" gives a preliminary estimate of the ability of the Trans-Siberian Railroad to support a military build-up and/or operations in the Far Eastern Sino-Soviet border regions. It is assumed that the major build-up would take place east of Lake Baykal.

*Note: This memorandum was produced solely by CIA. It was prepared by the Office of Economic Research and coordinated with the Office of Strategic Research and informally with the responsible analysts in the Defense Intelligence Agency.*

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USSR: Trans-Siberian Railroad



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**SECRET**General

1. The route referred to as the Trans-Siberian Railroad is a composite of segments of four connecting railroad systems extending eastward from Omsk in Western Siberia to Vladivostok on the Sea of Japan, a distance of 6,581 kilometers (km), or 4,089 miles (see the map). These segments and the railroad systems that administer them are as follows:

- a. Omsk to Mariinsk: West Siberian Railroad, 1,003 km;
- b. Mariinsk to Petrovskiy Zavod: East Siberian Railroad, 2,071 km;
- c. Petrovskiy Zavod to Arkhara: Transbaykal Railroad, 2,298 km; and
- d. Arkhara to Vladivostok: Far Eastern Railroad, 1,209 km.

2. The Trans-Siberian Railroad system, double-tracked throughout its entire length, is the life line of the Soviet Far East. East of Tayshet, the eastern terminus of the South Siberian Railroad, it is the only through rail line across Siberia. Furthermore, there is no parallel highway transport system and only minor water transport is available. Air transport is used extensively for passenger traffic and to some extent for lightweight, high-value goods, but air transport is not practical, in peacetime at least, for bulky freight with a low value-to-weight ratio. Some freight is shipped from Soviet European ports to Soviet Far Eastern ports by sea, but since the closure of the Suez Canal this trip takes 40 to 45 days. Under emergency conditions, this sea route could be greatly expanded since the USSR has become a major maritime power. The Far Eastern ports of Vladivostok and Nakhodka have a combined daily military unloading capacity of over 60,000 metric tons. The Northern Sea route through the polar seas is almost unused for through shipments from the European USSR to the Soviet Far East.

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3. The sparsity of lines and the vulnerability of the Trans-Siberian have long been a matter of prime concern to Soviet economic and military planners. In the 2,400 km between Mogocha and Vladivostok, the railroad is seldom more than 80 km from the frontier with China and in many places it is no more than 15 km removed.

4. The Trans-Siberian Railroad and its branches serve three major ports, all on the east coast: Nakhodka, Vladivostok, and Sovetskaya Gavan'. The branch line serving Nakhodka, now the most important Far East commercial port, is a single-track line winding 164 km through mountainous terrain from the branching point at Uglovaya.\* The 800-km branch line from Volochayevka serves the port of Sovetskaya Gavan'. However, the lack of a permanent bridge across the Amur River at Komsomol'sk, where the river is 3 km wide, limits the use of the port.\*\*

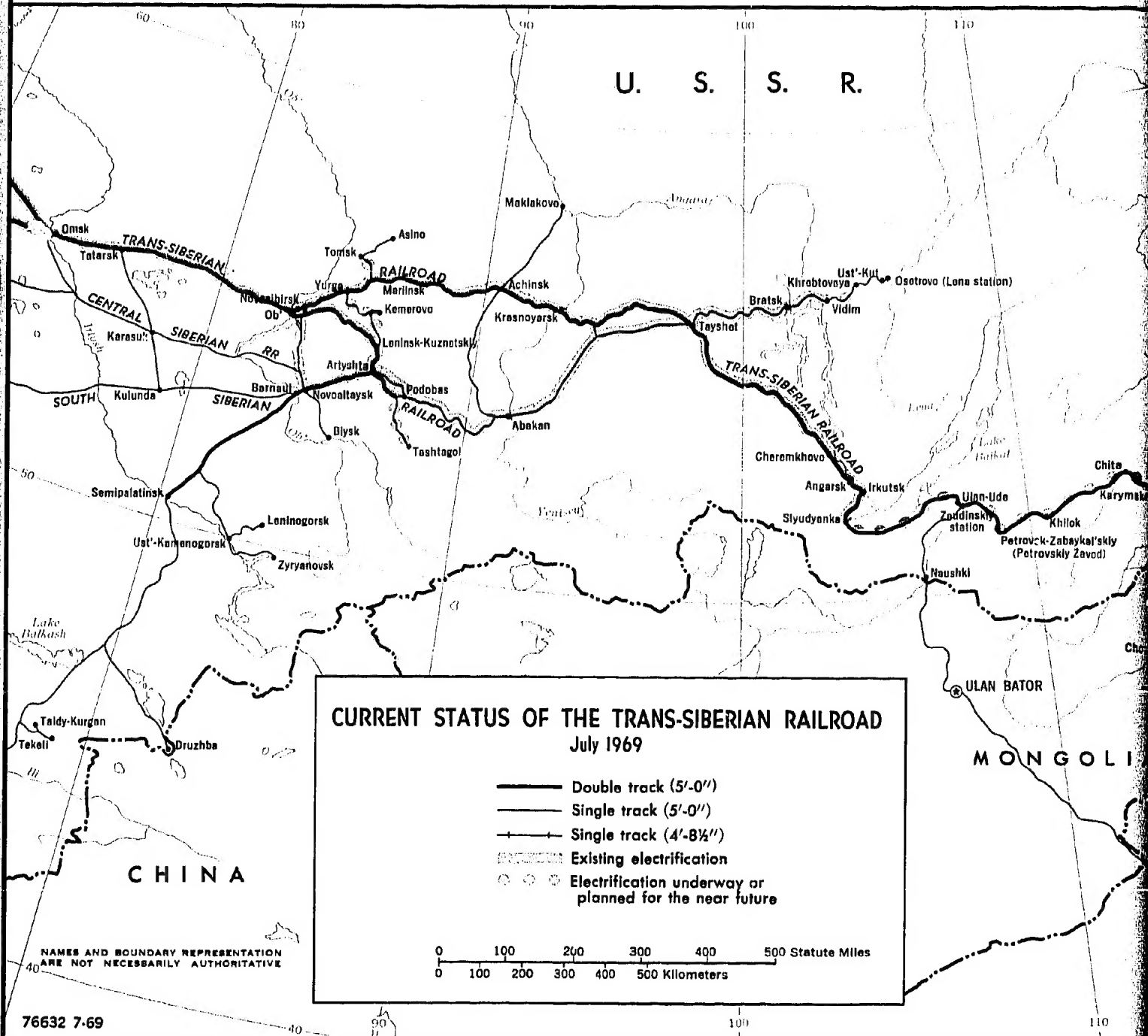
5. The Trans-Siberian has international connections with the standard gauge systems of Communist China and North Korea.\*\*\* There are three lines connecting with China: one line extends south from Zaudinskiy, just east of Ulan Ude, crosses into Mongolia at Naushki and extends through Mongolia to a transloading station at Erh-lien-hao-t'e on the Chinese border. The second line extends southeast from Tarskaya to the transloading yards at Zabaykal'sk/Man-chou-li. A branch from this line also extends to Choybalsan in Mongolia. The third line extends northwest from Voroshilov on the Far Eastern System to the Chinese border at Sui-fen-ho. The transloading facilities are at Grodekovo, about 18 km inside

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\* This branch actually terminates at Tikhookeanskaya, 10 km beyond Nakhodka station.

\*\* Railroad cars are ferried in summer and a temporary bridge is erected on the ice in the winter. In the spring and fall (about 100 days), trains cannot cross the river.

\*\*\* The Trans-Siberian, like nearly all Soviet mainline railroads, employs 5 foot gauge. Standard gauge is 4 feet-8-1/2 inches.







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the Soviet border. The line connecting with the Korean railroad extends from Baranovskiy on the Far Eastern System to a transloading yard at Kasan, about 3 km from the Korean border.

**Traffic and Capacity**

6. Normal economic traffic on all sectors of the Trans-Siberian mainline is believed to be at a level well below the normal sustained capacity of the line.\* Traffic has been increasing steadily over the entire line, but greatest growth during the last decade has been in central Siberia between Omsk and Irkutsk, coinciding with the Soviet emphasis on the economic development of that area. Density of traffic between Omsk and Novosibirsk on the West Siberian segment is heavier than on any other section of the Soviet railroad system, mainly because of the heavy coal traffic moving from the Kuznetsk Coal Basin to the Urals. This section has reached a traffic density of more than 90 million metric tons per kilometer of route, more than five times the average of 16.8 million tons for the entire railroad system of the USSR in 1968. Recent Soviet reports state that a freight train passes a given point of this route every eight minutes, a total of 180 trains per day, which over time would balance out to roughly 90 trains each way per day (TEWPD). The USSR announced that it has achieved a train density for that section of 120 TEWPD, which is probably near the capacity for this sector.

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7. Heavy traffic also characterizes the entire West Siberian Railroad and segments of the East Siberian Railroad between Mariinsk and Slyudyanka, located at the southern tip of Lake Baykal. From Novosibirsk to Slyudyanka the traffic drops to well below 90 TEWPD, but capacity is estimated at more than 100 TEWPD. East of Slyudyanka both traffic and capacity decline.

8. The most restrictive section of the route lies to the east of Lake Baykal, between Ulan Ude on the eastern end of the East Siberian Railroad and Khilok on the Transbaykal Railroad, a distance of 293 km, but the capacity of this section is at least 50 TEWPD.\* Fragmentary data for earlier years and recent passenger schedules suggest that about 65 percent of this capacity was being utilized for normal economic traffic. Current traffic data for this section of railroad are not available.

9. Normal eastbound freight traffic through the restrictive section (Ulan Ude-Khilok) probably has reached an annual level of about 15 million tons. A breakdown of this traffic, by major commodity category, is estimated in the following tabulation:

	<u>Million Tons Per Year</u>	<u>Percent of Total</u>
Petroleum	5.0	32
Coal	2.8	18
Agricultural	2.6	17
Ores	0.9	6
Wood	0.5	3
Other	3.7	24
<i>Total</i>	<i>15.5</i>	<i>100</i>

*\* This estimate assumes automatic or semiautomatic block signaling and diesel motive power on this segment of the line. Lack of information on the distance between signals and on the adequacy of various supporting facilities (yards, sidings, and maintenance shops) limits the ability to estimate with any precision. Under short-term emergency conditions or with unexpected improvements, the estimate might be at least doubled.*

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**SECRET**Improvement -- Electrification and Dieselization

10. A series of improvements to the Trans-Siberian Railroad have increased the traffic capacity of all segments, so that capacity probably now is well in excess of normal traffic. A significant volume of normal traffic has been diverted from the western segment of the Trans-Siberian Railroad by the construction of the South Siberian Railroad, which was electrified while under construction. The principal factor in the increased freight capacity, however, has been the replacement of steam locomotives on all sections of the Trans-Siberian route by either diesel or electric locomotives. Generally speaking, dieselization with ancillary improvements increases the capability of a given segment of a railroad route by at least 50 percent in terms of the number of trains that can be operated daily. Electrification brings an even greater increase.

11. Decisions about electrification or dieselization of various sections of the Trans-Siberian Railroad have been based largely on the volume of traffic, but other factors such as steepness of grades, suburban passenger traffic, and the availability and cost of electricity have been important in decisions about some stretches. The Omsk-Novosibirsk section was among the first to be electrified. Some of the steepest grades (2 percent) on the route occur between Irkutsk and Slyudyanka, and this section was also one of the first sections to be electrified.\*

12. At present, over 40 percent of the Trans-Siberian Railroad has been electrified. Electrification has been completed from Omsk to Slyudyanka, some 2,601 kilometers. Electrification is also under way from Slyudyanka to Petrovskiy Zavod, a distance of 473 kilometers. This is to be completed by 1970. Also electrified are a 112-km section of the Far Eastern Railroad from Ussuriysk to

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\* Grades are as steep as 2.8 percent on the Nakhodka branch.

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Vladivostok and the 164-km branch to the port of Nakhodka. Diesel motive power has effectively replaced steam on all other mainline sections of the route, although steam locomotives are still used for passenger traffic and for switching at many stations along the route.

### Other Improvements

13. A number of other improvements have been made on the Trans-Siberian Railroad, mostly in the past decade. Automatic block signals are now on all of the electrified sections, and centralized traffic control has been installed on the more heavily used segments. Automatic block signaling is also in use on all of the nonelectrified sections of the East Siberian Railroad. Automatic block signaling probably is being installed on some other sections, but semi-automatic block signaling is still in use on many sections. According to Soviet railroad officials, all locomotives running in automatic block territory are also equipped with cab signals and with automatic stop devices. The principal means of communication is the telephone, but radio stations supplement the telephone on some sections of the route. All railroad stations are connected by the independent railroad telephone network. Considerable funds have also been expended in recent years to improve the roadbed on the mainline and to mechanize the principal yards. Heavier rails, weighing at least 50 kilograms and up to 65 kilograms per linear meter, have been laid on the sections with the most traffic. Presumably, sidings have been lengthened and more yard tracks and diesel maintenance facilities have been installed to realize fully the advantages of diesel and electric traction; however, complete information on these points is not available.

### Problems and Plans

14. Aside from problems brought on by the increased traffic load, the Trans-Siberian Railroad, like many rail lines in the USSR, suffers interruptions of traffic by weather or other acts of nature. On the electrified sections east of Novosibirsk and extending to Slyudyanka, operations often are hindered by ice buildup on the overhead catenary system in wintertime. Also frozen switch points

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and damage to roadbed and communications equipment occur frequently, particularly in Siberia where the temperature drops to -40°F. for at least 60 days of the year. Floods from spring thaws and buckling rails from frost heave also cause frequent traffic disruptions.

15. The USSR plans further improvements for the Trans-Siberian Railroad. These include the electrification of an additional portion of the East Siberian Railroad from Petrovskiy Zavod to Karymskaya, a distance of 510 km. When the current electrification program is completed (presumably in the early 1970's), about 56 percent of the route will be electrified and 44 percent dieselized. Other improvements which are planned are a permanent bridge across the Amur River at Komsomol'sk, reconstruction of the portion of the line between the Amur River port of Pivan' and Sovetskaya Gavan', and a rail ferry connecting this line with Sakhalin.

#### Capability for Military Support

16. Soviet troops operating in the Siberian or Far Eastern areas are supplied primarily by rail.\* Presumably, most of a military buildup would follow the present pattern of deployment and be concentrated in the border regions east of Lake Baykal. The section of route with the lowest estimated capacity, the Ulan Ude-Khilok segment, would set the limits of military support which the Trans-Siberian route could provide.\*\*

\* Under emergency conditions, supply by sea through Far Eastern ports could be greatly expanded over a period of more than 45 days. Substantial supplementary airlift capacity is also available on short notice.

\*\* Soviet operations against Sinkiang would be logistically supported by the Kazakh Railroad System, which has a line running to Druzhba near the Dzungarian gate, a traditional invasion route. We have not estimated the military support capabilities of this route.

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17. Using minimum capacity estimates for the section east of Ulan Ude, and allowing for normal traffic requirements, the unused capacity available could handle at least 17 additional TEWPD when the military buildup began. At an average of 1,200 tons per train, this would permit a military movement of 20,400 tons.\* The 17 TEWPD could move slightly less than one half division per day -- based on an estimate of 38 trains needed to move a division.\*\* Soviet forces east of Lake Baykal have been more than doubled between 1966 and 1969, from 11 to at least 25 divisions and from 7 to 15 air regiments.

18. Military resupply, using the available capacity of this section of the line, would permit the movement of 27,200 tons at an average of 1,600 tons per train. Thus the available capacity would be adequate for the resupply of about 27 divisions, based on the requirement of about 1,000 tons per day per division under average combat conditions.\*\*\* These figures include tactical air support and are based on the present ratio of ground to air units in the area. Military resupply requirements are about 550 tons a day for a motorized rifle division and 600 tons a day for a tank division for average combat. These figures are increased to 675 and 750 tons, respectively, for attack conditions. Tactical air support is supplied by fighter and light bomber/reconnaissance regiments which require a daily average of 350 and 650 tons, respectively, for the initial combat stage (calculations based on DIA estimates).

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19. The principal elements in these requirements are POL and ammunition, and both of these items are available only to a limited degree in the eastern areas of the USSR. Most of the rations would also have to be shipped because these regions are food-deficit areas. Only water, the third largest but a still minor category of supply, could be provided locally. The more general Class II and IV military supplies, primarily spare parts, medical supplies, construction materials, and personal supplies, would be available only in limited quantities in the local areas. The Soviet Union has had ample time to support the troops presently stationed in these areas with a substantial supply of all classes of supplies, although the actual level of stockpiles is unknown.

20. In an emergency additional buildup of Soviet forces on the Chinese border, the total capacity of the Trans-Siberian route would be subject to military priority. The estimated capacity of at least 50 TEWPD would permit the transit of about one and one-third divisions per day through the bottleneck sector, and troops and supplies probably would be moving each way in the sectors east of Lake Baykal. The real bottleneck, however, is the west-to-east movement because most of the additional troops and most of their supplies would come from west of Lake Baykal. In an emergency, the east-to-west traffic would retain much more of a normal pattern.

21. For any situation short of an emergency, priorities would have to be established to achieve the desired balance between military and civil traffic. The urgency of the military buildup would determine the amount of the traffic capacity to be switched from civil to military use. It may be seen from the tabulation in paragraph 9 that some 50 percent of the civil movement eastward through the restrictive sector is fuel -- petroleum (32 percent) and coal (18 percent). Agricultural goods (17 percent) and other freight (24 percent) -- including consumer goods and industrial equipment -- represent the other major categories of normal economic tonnage. Normal deliveries of all economic goods could be reduced at least for a short period by one-third, and an additional capability of some 9 trains per day would be gained. Total capacity for military movement under these conditions would then be 26 trains (31,200 tons) per day.



**SECRET**Conclusions

22. The Trans-Siberian Railroad is the only through route across Eastern Siberia and the Soviet Far East. It is double-tracked along its entire length, from Omsk in Western Siberia to Vladivostok on the Pacific coast. There is little supplementary inland water transport and almost no highway movement. Since the USSR is a major maritime power, it could organize a sealift from the Black Sea to the Far Eastern ports. Such a sealift probably could be made available within two months of a decision to do so, and could provide a substantial supplement to the Trans-Siberian Railroad.

23. The growing volume of traffic over the past decade has necessitated a number of improvements on the Trans-Siberian. Major programs of electrification and dieselization have been carried out, and steam motive power for mainline freight movement has been eliminated. These improvements have increased the capability of the route to a level believed to be well in excess of normal traffic demands. Moreover, improvements now under way and planned will further increase the capability of the route to meet the long-term demands of economic growth in the regions through which it passes.

24. The capability of the Trans-Siberian Railroad to support military reinforcement and resupply in the Soviet frontier regions east of Lake Baykal is limited by the Ulan Ude-Khilok section. This bottleneck section has a capacity to handle at least 50 trains each way per day (TEWPD), or about 80,000 tons.

25. Preliminary estimates of logistic support capabilities of the Trans-Siberian, under wartime conditions, are as follows:

a. With normal civilian traffic flowing, about 17 military trains a day could be accommodated. Theoretically, this would be enough to support 27 divisions in combat. Since all elements of a large military force are unlikely to be engaged simultaneously in combat for extensive periods of time, a force somewhat larger than 27 divisions and their supporting air regiments could probably be sustained in wartime.

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b. If normal civilian traffic were cut one-third, about 14,000 tons of additional capacity (some nine additional trains) would be made available for military movement. Total capacity available to the military under these conditions would permit combat resupply of existing units east of Lake Baykal and reinforcement at nearly one-fourth of a division a day.

c. The theoretical limit of troop movement with no civilian traffic moving from west to east would be at one and one-third divisions a day.